



WHITE EAGLE
AEROSPACE



Advanced Missile Aerodynamics

MAKE YOUR CAREER SOAR



Course Description

The Advanced Missile Aerodynamics (AMA) short course provides an advanced training experience in classic engineering-level prediction methodologies used in the estimation of missile and missile-like vehicle aerodynamics characteristics.

This rigorous short course has direct application to a wide variety of missile classes, including: tactical missiles, ballistic missiles, launch vehicles, sounding rockets and projectiles. Participants will learn about Slender Body Theory and its pervasive influence in aero prediction methods. They will also come to understand the technical basis of the classic component build-up approach, body alone aero prediction methods and the Equivalent Angle-of-Attack method for lifting surfaces.

Course material features technical details related to a myriad of diverse topics, including: local surface inclination pressure methods, mutual aerodynamic interference, and 6-DOF aerodynamic modeling schemes.. Technical briefings are provided for a number of significant historical missile programs. These case studies provide valuable insights and lessons learned that are directly applicable to job performance.

This intensive technical short course is unique in terms of its topic and breadth and depth of subject matter. A course of its equal is not to be found among the curricula of any other present-day university or continuing education provider.

Key Course Topics

- Slender Body Theory
- Equivalent AoA Method
- Component Build-Up
- Body Alone Methods
- Pressure Methods
- Aerodynamic Interference
- 6-DOF Aero Model Schemes
- Launch Vehicle Aero
- High-Temperature Effects
- Flush Airdata Systems
- Transonic Area Rule
- Supersonic Area Rule
- Base Drag
- Body Crossflow Effects
- Shock-Expansion Method
- Newtonian Theory
- Aero Database Sources
- Viscous Interaction
- Aerodynamic Uncertainty
- Force Accounting
- Aero Prediction Codes
- Historical Flight Programs





Course Outline

Advanced Missile Aerodynamics (AMA) is intended for the aerodynamicist seeking an advanced training experience in classic engineering-level aero prediction methodologies used in the estimation of missile, sounding rocket, launch vehicle, and projectile aerodynamics characteristics.

Advanced Missile Aerodynamics Module Overview

Day	Module	Lecture Title	Key Topics
1	1	Slender Body Theory	Conservation laws, irrotationality, velocity potential, perturbation theory, axisymmetric flow.
	2	Component Build-Up Methodology	Component build-up, NACA TR-1307, body upwash, wing carryover, vortex downwash, lift interference factors.
2	3	Equivalent Angle-of-Attack Methodology	Angle-of-attack effect, body carryover determination, roll angle effects, control surface deflection effects.
	4	Body Alone Aero Prediction Methods	Allen and Perkins Method, Brevig and Rausch Method, Baker Method, Jorgensen Method, Clark and Trimmer.
3	5	Local Surface Inclination Pressure Methods	Linear Theory, Higher-Order Theory, Newtonian Theory, Tangent Wedge, Tangent Cone, Shock Expansion Theory.
	6	Mutual Aerodynamic Interference	Body upwash, panel carryover, vortex effects, component airloads, body alone, body-tail, body-wing tail airframes.
	7	Aerodynamic Modeling Schemes	Panel-panel interference, 1 st Order and 2 nd Panel Schemes, Dual Panel Scheme, Combined Panel Scheme.
4	8	Launch Vehicle Aerodynamics	Trajectory loads, aeroacoustical loads, compartmental venting, buffeting, stage separation, wind effects.